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CLAIMS

[Claim(s)]
[Claim 1] It is the noise filter characterized by preparing the capacitor for absorbing the energy of said high
frequency component, and the series circuit of resistance in the noise filter consists of two or more reactive
elements, the low frequency component of an input signal makes pass, and it was made for the noise which is a
high frequency component not to pass.
[Claim 2] The noise filter characterized by for a noise filter according to claim 1 being a noise filter of T mold
which connected one capacitor with two coils in the shape of T character, and connecting the series circuit of
resistance with said capacitor between the input terminal.
[Claim 3] It is the noise filter characterized by connecting the resistance for [of said two or more reactive
elements] absorbing the energy of said high frequency component for all the capacitive reactance all [a part
or] at least at a serial in the noise filter it was made for the noise which you consist of two or more reactive
elements, and the low frequency component of an input signal makes it pass, and is a high frequency component
not to pass.
[Claim 4] The noise filter with which a noise filter according to claim 3 is a noise filter of pi mold which
connected two capacitors with one coil in the shape of a pi character, and is characterized by the thing of said
two capacitors for which said resistance was connected to the serial at least at the capacitor of an input side.
[Claim 5] The noise filter characterized by carrying out said resistance to claim 1 thru/or any 1 term of 4 in the
noise filter of a publication at variable resistance.
[Claim 6] The noise filter characterized by preparing the connection terminal for making said resistance external
in the exterior of a case in a noise filter given in claim 1 thru/or any 1 term of 5.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the noise filter used for the input circuit of the AC power supply
of various electronic equipment etc., i.e., a low pass filter.
[0002]
[Description of the Prior Art] A noise filter consists of two or more reactive elements (capacitor which is the
coil and capacitive reactance component which are an inductive reactance component), the low frequency
component of an input signal makes it pass, the noise which is a high frequency component is the low pass filter
circuit it was made not to pass, and two kinds of circuits as shown in drawing 10 are one of the typical thing.
[0003] (a) of drawing 10 is the noise filter of T mold, and 5 which connects one capacitor C with two coils L1
and L2 in the shape of T character like illustration between input terminals 1 and 2 and output terminals 3 and 4,
and is shown with a broken line is a case. (b) of drawing 10 is the noise filter of pi mold, and 5 which connects
two capacitors C1 and C2 with one coil L in the shape of a pi character like illustration between input terminals
1 and 2 and output terminals 3 and 4, and is shown with a broken line is a case.
[0004] Such a conventional noise filter was what it consisted of only a reactive element, i.e., a capacitor, and a
coil (inductor), and the chief aim has set only to the frequency characteristics, is made to pass a signal
component with the frequency characteristics, and removes a noise component. Here, with a pure reactance,
since there is no resistance component, energy is not exhausted. Therefore, since the component which cannot
be entered and passed from an input terminal does not have a destination, it will return to the place of an input
terminal, without exhausting energy.
[0005]
[Problem(s) to be Solved by the Invention] Therefore, with such a conventional noise filter, except the passband,
since an impedance changed rapidly and big mismatching was produced, the harmonic content which had
passage and leakage prevented lost the going place, and had the problem of becoming a new noise generation
source, such as being reflected and producing a standing wave.
[0006] Although RF-ization progresses further and a close-up of the problem of electromagnetic wave disorder
(EMI) is taken, even if the digital circuit and switching power supply which turn into a noise generation source in
recent years put a noise filter into a circuit for noise reduction, the mole **** phenomenon which the frequency
of a noise only moves is considered because it is the fault the conventional noise filter is not taken into
consideration as mentioned above other than the target frequency when almost ineffective, and noise
absorptivity is faultless.
[0007] In the switching power supply by which this problem treats power, it is much more remarkable, and also
although the signal reflected at the input edge of a noise filter is called harmonic content, since it has
remarkable energy, it is in the situation which cannot do the cure against EMI completely.
[0008] This invention aims at offering a noise filter with the noise absorptivity which generates neither the
reflected wave which is made in view of the trouble of such a conventional noise filter, and serves as a new
noise generation source by use of a noise filter, nor a standing wave.
[0009]
[Means for Solving the Problem] In order that this invention may attain the above-mentioned purpose, you
consist of two or more reactive elements, the low frequency component of an input signal makes it pass, and the
noise which is a high frequency component prepares the capacitor for absorbing the energy of a high frequency
component (noise component), and the series circuit of resistance in the noise filter it was made not to pass.
When the noise filter is a noise filter of T mold which connected one capacitor with two coils in the shape of T
character, it is good between the input terminal to connect the series circuit of resistance with the above-

mentioned capacitor.

[0010] Or the resistance for [of two or more reactive elements which constitute a noise filter] absorbing the energy of a high frequency component for all the capacitive reactance all [a part or] at a serial may be connected at least. When the noise filter is a noise filter of pi mold which connected two capacitors with one coil in the shape of a pi character, it is good for inside [it is the two capacitor] to connect the above-mentioned resistance to a serial at least at the capacitor of an input side.

[0011] In these noise filters, it is good to make the above-mentioned resistance into variable resistance, and to enable it to set it as resistance with the largest noise depressor effect according to the generating situation of a noise. Or the connection terminal for making the above-mentioned resistance external is prepared in the exterior of a case, and you may enable it to connect the optimal resistance according to a noise component.

[0012]

[Embodiment of the Invention] Hereafter, the example of this invention is concretely explained with reference to a drawing. Drawing 1 is the circuit diagram showing 1 operation gestalt which carried out this invention in T mold noise filter, in a case 5, connects one capacitor C with two coils L1 and L2 which are reactive elements in the shape of T character, and constitutes the noise filter (low pass filter) of T mold. And the series circuit (called a snubber circuit) of Resistance Rs is connected with the capacitor Cs for absorbing the energy of the high frequency component (noise component) which does not pass this noise filter between that input terminal 1 and 2.

[0013] The property at the time of connecting the same source 6 of an AC signal as a noise filter, the input resistance R1, and load resistance Rs of T mold indicated to be a property at the time of connecting the source 6 of an AC signal through input resistance R1 like illustration between the input terminal 1 of this noise filter and 2, and connecting load resistance R0 between an output terminal 3 and 4 to (a) of drawing 10 (conventional example) is shown in drawing 3 and drawing 4 . Output characteristics and drawing 4 are the diagram showing the input impedance characteristic to the frequency of an input signal, respectively, and it is the case of drawing 1 according [all / an alternate long and short dash line Ts] to this invention the case of the conventional example in a continuous line T. [as opposed to the frequency of an input signal in drawing 3]

[0014] In drawing 1 , if it calculates only using the alternating current theory by setting to Vs the electrical potential difference which generates the electrical potential difference which generates the output voltage of the source 6 of an AC signal between V1, an output terminal 3, and 4 to the both ends of the resistance Rs V2 and for noise absorption, the following several 1 will be realized.

[0015]

[Equation 1]

$$V2-/V1 = R0 (1+j\omega CsRs) / (P+jQ)$$

$$Vs/V1 = CsRs[\omega^4 CL1L2 - \omega^2 (L1+L2)$$

$$+ j\omega R0(1-\omega^2 CL1)]/(P+jQ)$$

$$P = R0+R1-\omega^2\{L1Cs (R1+Rs)$$

$$+R0C(L1+R1R2Cs)$$

$$+L2C(R1+R2)+L2CR1\}$$

$$+ \omega^4 L2CsL1C (R1+Rs)$$

$$Q/\omega = (L1+L2) +Cs (R0R1+R0 Rs+R1Rs)$$

$$+ CR0R1-\omega^2 CsC(L1R0R1+L1R0Rs +L2R1Rs)-\omega^2 CL1L2$$ [0016] When the capacity of Capacitors C and Cs, and R1, R0 and Rs set the frequency of an electrical potential difference V as the resistance of Resistance R1, R0, and Rs and omega sets the inductance of coils L1 and L2, and C and Cs to f, L1 and L2 in this several 1 are 2pif. while referring to these formulas — L1=L2=150nH, C=Cs=100pF, and R1=R0=Rs=50ohm ****** — the assistance of CAD was borrowed and the curve shown in drawing 3 with an alternate long and short dash line Ts asked for the output characteristics of the noise filter of drawing 1 . As shown in this drawing, there are not output characteristics in the case of the conventional T mold noise filter shown as a continuous line T and a big difference, and the inclination in a 60-100MHz band of them is the same as that of the former at 18 dB/oct.

[0017] Input impedance seen from the input terminals 1 and 2 of drawing 1 on the other hand Z=R+jX When a part for R and a reactance is set to X for an absolute value, i.e., a resisted part, the alternate long and short dash line Ts of drawing 4 which showed the property of |Z| called for by the following several 2 is greatly different from the continuous line T which shows the property of the conventional example. In the conventional property, if the frequency of an input signal exceeds a cut off frequency, an input impedance will become large rapidly. This is for a resisted part to become close to 0 and for the amount of reactance to increase rapidly (it results in infinity).

[0018]
[Equation 2]
$$|Z| = \sqrt{R^2 + X^2}$$

[0019] Therefore, in the conventional T mold noise filter, the input impedance serves as a pure reactance gradually, therefore it becomes impossible to have absorbed energy, and was all reflected as it became a high frequency. On the other hand, also out of a passband, the property of the noise filter by this invention shown with an alternate long and short dash line Ts does not become so big change, but is converged on the impedance in a passband. Therefore, without also reflecting the higher-harmonic-wave (noise) component outside a passband, it flows to the capacitor Cs of drawing 1 , and the series circuit of Resistance Rs, and the energy is absorbed by Resistance Rs, changes to heat energy, and is exhausted.

[0020] Therefore, the noise component in an input signal can be controlled effectively, without it seeming that a noise filter becomes a new noise generation source. Furthermore, if resistance Rs is made into drawing 1 at variable resistance as a broken line shows, according to the generating situation of a noise, it can be set as resistance with the largest noise depressor effect (adjustment).

[0021] Drawing 2 is the circuit diagram showing 1 operation gestalt which carried out this invention in pi mold noise filter. In a case 5, two capacitors C1 and C2 are connected with one coil L which is a reactive element in the shape of a pi character, and the noise filter (low pass filter) of pi mold is constituted. And the resistance Rs for noise absorption is connected to the capacitor C1 of the input side of the two capacitors C1 and C2 at a serial.

[0022] And the property at the time of connecting the same source 6 of an AC signal as pi mold noise filter which showed the property at the time of connecting the source 6 of an AC signal through input resistance R1 like illustration between the input terminal 1 of this noise filter and 2, and connecting load resistance R0 between an output terminal 3 and 4 like the above-mentioned case to (b) of drawing 10 , input resistance R1, and load resistance R0 (conventional example) is shown in drawing 5 and drawing 6 . Output characteristics and drawing 6 are the diagram showing the input impedance characteristic to the frequency of an input signal, respectively, and it is the case of drawing 2 according [all / alternate long and short dash line pis] to this invention the case of the conventional example in a continuous line pi. [as opposed to the frequency of an input signal in drawing 5]

[0023] In drawing 2 , if it calculates only using the alternating current theory on the same conditions as the case of drawing 1 , the following several 3 will be realized.

[0024]
[Equation 3]
V2-/V1=R0 (1+jomegaC1Rs) / (P+jQ)
Vs/V1=RsC1 [-omega2 L+jomega (R0-omega2LR0C2)]
/(P+jQ)
P=R0+R1-omega2{R0C2 (L+R1RsC1)
+LC1(Rs+R1)}
Q=omega {R0C1(R1+Rs)+C2R0R1+L+R1RsC1 -omega2R0C1C2L (R1+Rs)}

[0025] these formulas — using — L=150nH, 2= 100pF of C1=C, and R1=R0=Rs=50ohm ****** — the assistance of CAD was borrowed and the curve shown in drawing 5 by alternate long and short dash line pis asked for the output characteristics of the noise filter of drawing 2 . As shown in this drawing, in the case of the conventional T mold noise filter which the inclination of a cut-off frequency band shows as a continuous line pi, it becomes 12 dB/oct to being 18 dB/oct, and that cut-off characteristic deteriorates a little.

[0026] However, as shown in drawing 6 , the input-impedance absolute value seen from the input terminals 1 and 2 of drawing 2 is converged on the same impedance (this example 50ohms) as the inside of a passband so that change may have little direction in the case of the noise filter of drawing 2 by this invention shown by dashed-line pis compared with the case of the conventional pi mold noise filter shown as a continuous line and an input impedance may hardly become zero also out of a passband. Therefore, in case it flows to the capacitor C1 of drawing 2 , and the series circuit of Resistance Rs, without also reflecting the higher-harmonic-wave (noise) component outside a passband, the energy is absorbed by Resistance Rs, changes to heat energy, and is exhausted.

[0027] Therefore, the noise component in an input signal can be controlled effectively, without it seeming that a noise filter becomes a new noise generation source also in this case. With this operation gestalt, although some properties worsen, an expensive coil can be managed with one piece, and since the capacitor of the circuit for noise absorption also makes the capacitor as a reactive element which constitutes a noise filter serve a double

purpose, it has the advantage which can be carried out by low cost. Furthermore, if resistance Rs is made into drawing 2 at variable resistance as a broken line shows, according to the generating situation of a noise, it can be set as resistance with the largest noise depressor effect (adjustment).

[0028] T mold noise filter which drawing 7 and drawing 8 showed other operation gestalten of this invention, and showed drawing 7 to drawing 1 , and drawing 8 make external resistance Rs respectively for noise absorption in pi mold noise filter shown in that of drawing 2 . That is, in the noise filter shown in drawing 7 , among the capacitor Cs for absorbing a noise, and the series circuit of Resistance Rs, Capacitor Cs was formed in the case 5, the connection terminals 7 and 8 for carrying out external [of the resistance Rs] are formed in the exterior of a case 5, and the resistance Rs of the optimal resistance is connected to the connection terminals 7 and 8 according to the generating situation of a noise.

[0029] In the noise filter shown in drawing 8 , the connection terminals 7 and 8 for carrying out external [of the resistance Rs for noise absorption] are formed in the exterior of a case 5, and the resistance Rs of the optimal resistance is connected to the connection terminals 7 and 8 at a serial at the capacitor C1 of the input side which constitutes pi mold noise filter according to the generating situation of a noise.

[0030] Drawing 9 is the circuit diagram showing the operation gestalt of further others of this invention. (a) makes common connection of the common line side of two capacitors C1 and C2 which constitute pi mold noise filter, and inserts the resistance Rs for noise absorption between the common lines 9 to which the Node a, input terminal 2, and output terminal 4 are connected. (b) of drawing 9 inserts the resistance Rs for noise absorption between the common line side of the capacitor C which constitutes T mold noise filter, and the common line 9.

[0031] Thus, although what is necessary is to connect the resistance for absorbing the energy of a high frequency component (noise component) to a serial to all the all [some or] of two or more reactive elements which constitute a noise filter that are capacitive reactance components at least, or just to connect the series circuit of resistance for noise absorption with a capacitor independently, the resistance for noise absorption may be further connected also to the coil which is a capacitive reactance component at a serial.

[0032] Moreover, as for this invention, it is needless to say that it is applicable like each operation gestalt mentioned above not only like one step of noise filter (low pass filter) of T mold or pi mold but the noise filter which combined two or more steps of them and the noise filter by other circuitry.

[0033]

[Effect of the Invention] Since that energy is absorbed by resistance, without the passband component in an input signal passing the noise filter by this invention without a loss, and the noise component with a high frequency making it pass as explained above, a reflected wave, a standing wave, etc. used as a new noise generation source are not generated, and a noise component can be removed certainly.

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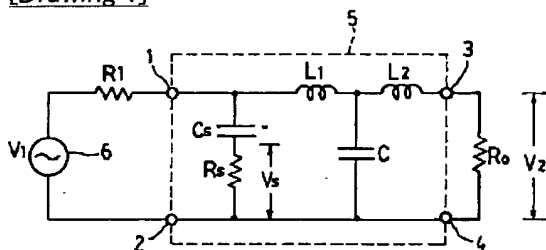damages caused by the use of this translation.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the circuit diagram showing 1 operation gestalt which carried out this invention in T mold noise filter.
[Drawing 2] It is the circuit diagram showing 1 operation gestalt which carried out this invention in pi mold noise filter.
[Drawing 3] It is the diagram showing the output characteristics of the noise filter shown in drawing 1 as compared with the case of the noise filter shown in (a) of conventional drawing 10 .
[Drawing 4] It is the diagram showing the input impedance characteristic of the noise filter shown in drawing 1 as compared with the case of the noise filter shown in (a) of conventional drawing 10 .
[Drawing 5] It is the diagram showing the output characteristics of the noise filter shown in drawing 2 as compared with the case of the noise filter shown in (b) of conventional drawing 10 .
[Drawing 6] It is the diagram showing the input impedance characteristic of the noise filter shown in drawing 2 as compared with the case of the noise filter shown in (b) of conventional drawing 10 .
[Drawing 7] It is the circuit diagram showing other operation gestalten which carried out this invention in T mold noise filter.
[Drawing 8] It is the circuit diagram showing other operation gestalten which carried out this invention in pi mold noise filter.
[Drawing 9] It is the circuit diagram showing the operation gestalt of further others of this invention.
[Drawing 10] It is the circuit diagram showing the basic configuration of the conventional T mold and pi mold noise filter.
[Description of Notations]
1 Two: Input terminal 3 Four: Output terminal 5: Case
6: Source of an AC signal 7 Eight: External resistance terminal
L, L1, L2: Coil (an inductor, inductive reactance component)
C, C1, C2: Capacitor (capacitive reactance component)
Cs: The capacitor of a noise absorbing circuit
Rs: Resistance for noise absorption R0: Load resistance
R1: Input resistance V1: Output voltage of the source of an AC signal

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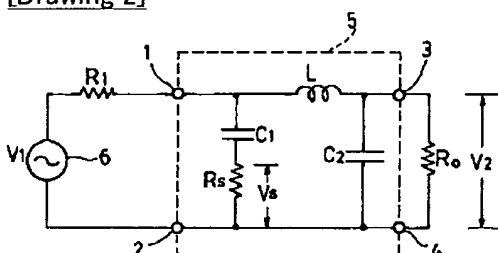2.**** shows the word which can not be translated.
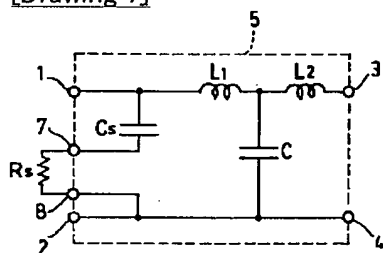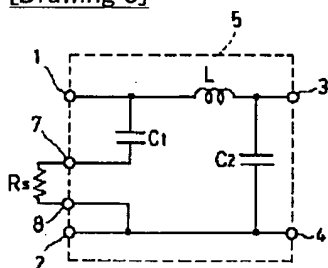3.In the drawings, any words are not translated.
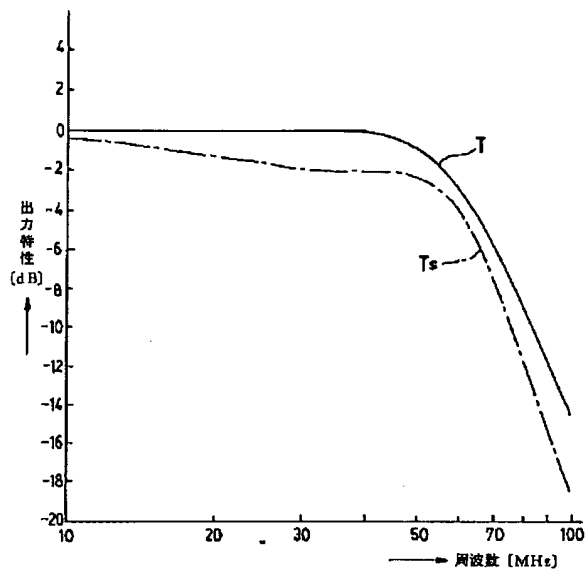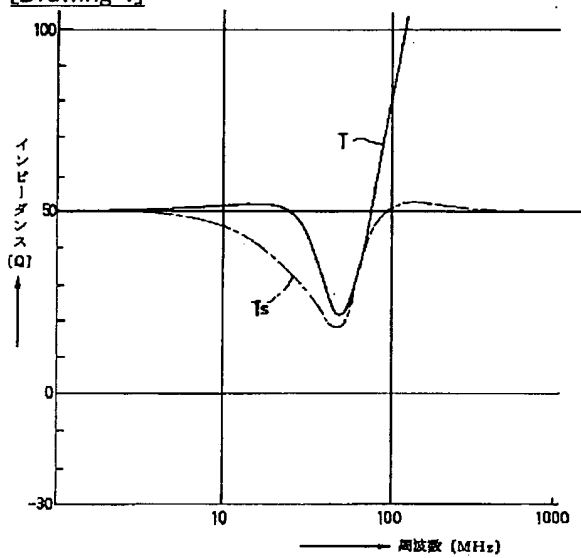
DRAWINGS

[Drawing 1]

[Drawing 2]

[Drawing 7]

[Drawing 8]

[Drawing 3]

出力特性〔dB〕

T

Ts

周波数〔MHz〕

[Drawing 4]

インピーダンス〔Ω〕
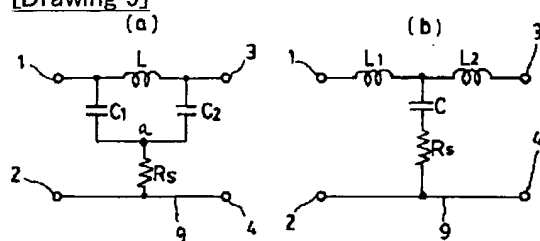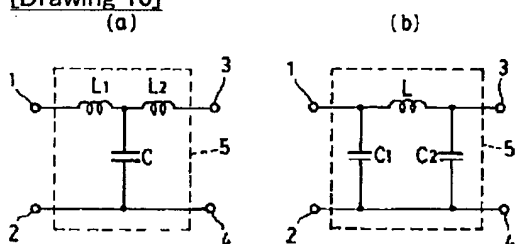
T

Ts

周波数〔MHz〕

[Drawing 5]

出力特性〔dB〕

π

πs

周波数〔MHz〕
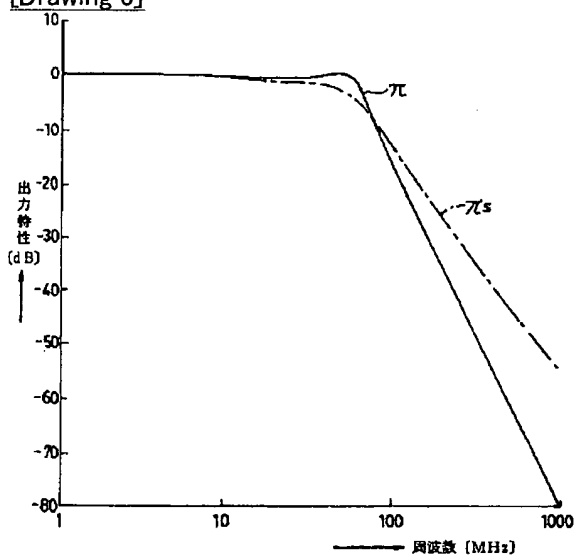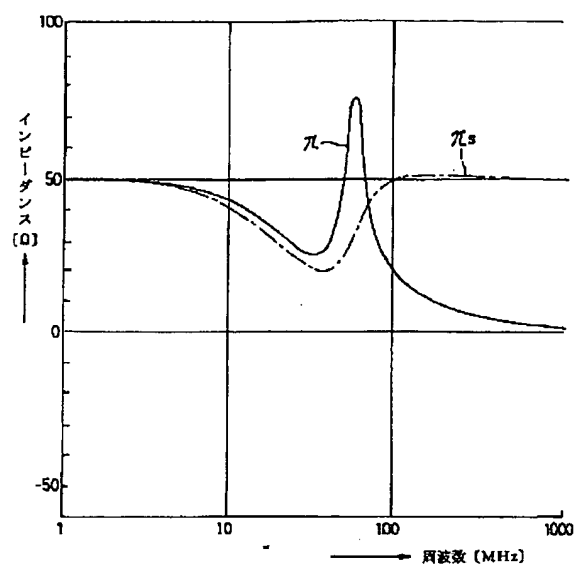
[Drawing 6]

[Drawing 9]

[Drawing 10]

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